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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/098,730	06/18/1998	TOMIO SUGIYAMA	PM-254782	4440

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EXAMINER	
OLSEN, KAJ K	
ART UNIT	**PAPER NUMBER**
1753	

DATE MAILED: 05/28/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	**Application No.**	**Applicant(s)**	
	09/098,730	SUGIYAMA ET AL.	
	Examiner	**Art Unit**	
	Kaj K Olsen	1753	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *18 March 2004*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,2,4,6,7,10,11,18-22 and 24-32* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2,4,6,7,10,11,18-22 and 24-32* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *3-18-04*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

2. Claims 1, 2, 4, 6, 7, 10, 11, 18-22, 26 and 29-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mase et al 4,861,456 in view of Suzuki et al 4,177,112.

3. Mase discloses an alumina layer 54 sandwiched by an insulating layer 50 and an electrolyte layer 28, an alumina layer 34 sandwiched by electrolyte layers 8 and 10. The alumina layers are porous for the purpose of minimizing stress due to difference in thermal expansion coefficients. Thus, the alumina layers 54 and 34 correspond to applicant's "boundary layer". See col. 6, line 50 to col. 8, line 38. Applicant's claims differ by calling for the boundary layer to have an average sintered particle size larger than the average sintered particle size of the electrolyte layer and the insulating layer.

4. Suzuki discloses forming a more porous layer 4' with larger particles than a neighboring layer 4. See col. 2, lines 38-49.

5. It would have been obvious for Mase, in view of Suzuki, to employ particles in the alumina boundary layers 54 and 34 larger than the particles of its neighboring solid electrolyte layer and insulating layer so as to obtain an alumina boundary layer more porous than its neighboring layers. Using larger particles would be an efficient, easy way to ensure a higher porosity for the alumina boundary layer, and render it unnecessary for additional treatment to achieve the desired higher porosity.

6. With respect to the new limitations of claims 1 and 18, boundary layer 54 is immediately between insulator element 50 and electrolyte 28. See fig. 3 and col. 9, lines 8-15 for a discussion of the fact that the gas-tight layer should be an insulator.

7. In regard to claims 26 and 29 (and new claims 30-32), it would have been obvious to make Mase's ceramic layer 50 of alumina or spinel, because layer 50 borders heater 46. So as avoid current leakage from heater 46, ceramic layer 50 needs to be of an insulating material. Alumina and spinel are among the most common ceramic insulating materials known (see col. 6, line 53 of Mase) and each would have been an obviously desirable material for layer 50. Aside from the fact that alumina is inexpensive and readily available, making layer 50 of alumina would render it thermally compatible with the other alumina layers (20, 26, 34) of the sensor.

8. Claims 24, 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mase et al in view of Suzuki et al and Sugino et al 5,593,558 and Tatumoto et al 5,522,979.

9. These claims further differ by calling for the alumina boundary layer 54 and 34 to be made primarily of alpha-alumina with an average sintering particle diameter of 3-4 microns. Sugino discloses an alumina layer in a solid electrolyte sensor comprising alpha-alumina. See col. 13, line 61. Tatumoto discloses alumina particles with a size of 2.3 microns, which is very close to applicant's 3 microns value. See col. 8, lines 35-40. It would have been obvious for Mase to use alpha-alumina with a particle size of 3 microns for its alumina layers 54 and 34 in view of Sugino and Tatumoto, since the incorporation of known features from analogous prior art functioning as expected is within the skill of the art.

10. Claims 25, 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mase et al in view of Suzuki et al and Watanabe et al 4,370,393 or Ikezawa et al 4,421,787.

11. These claims further differ by calling for the electrolyte layer to be made of zirconia partially stabilized by yttria with an average sintering particle diameter of 2-3 microns. Watanabe discloses yttria-stabilized zirconia to be a conventional solid electrolyte material. See col. 4, lines 25-29. Sample 22 in Table 1(c) shows a grain size of 3 microns. Ikezawa also discloses a conventional solid electrolyte of yttria-stabilized zirconia with a particle size of 0.5 to 8 microns. See col. 5, lines 21-41. It would have been obvious for Mase to adopt a yttria-stabilized zirconia electrolyte with a particle size of 3-4 microns in view of Watanabe or Ikezawa since the incorporation of known features from analogous prior art functioning ms expected is within the skill of the art.

Response to Arguments

12. Applicant's arguments filed 3-18-2004 have been fully considered but they are not persuasive. With respect to the rejection based on Res Judicata, these arguments are moot in the amendment to the claims. Because of that amendment, the Res Judicata rejection is being withdrawn.

13. With respect to the translations of references Hamano and Yokota, applicant urges that these teachings refute the examiner's argument that Suzuki establishes the equivalence of porosity and particle size. In particular, applicant urges that employing larger particles provides more porosity is not "universally true". The examiner fails to understand how the applicant came to this conclusion from these teachings. In the applicant's response of 8-19-2003, applicant urged that these two teachings showed that particle sizes change upon sintering (without ever explicitly identifying where these teachings even suggest that). Even if the

examiner accepts this conclusion from the applicant's reading of these teachings, how do we arrive at the conclusion that larger particles do not result in greater porosity? There does not appear to be any nexus between what the applicant alleges these teachings teach and the applicant's conclusion of these teachings. In addition, the examiner is confused by applicant's conclusion that particle size and porosity is not "*universally* true" (emphasis added). What does this mean? Is the relationship between particle size and porosity *generally* true? More specifically, is the relationship true for Suzuki? If its true for Suzuki, then it appear this whole line of argument is irrelevant. If others in the art have found this relationship to not always be true is irrelevant when the rejection is based on Suzuki, which did find it to be true for its instance. If the applicant believes the relationship is *not* true for Suzuki (i.e. Suzuki was mistaken in their conclusion that their use of larger particle sizes resulted in greater porosity), then applicant is invited to specifically rebut why Suzuki lacks enablement on this subject.

14. Applicant also argues that Mase does not teach that layer 50 is an insulating layer. However, this issue was already addressed by the previous examiner in the previous office action (see page 3 of action dated 10-22-2003). In addition, this examiner would point out col. 9, lines 8-16 of Mase which states that the gas tight ceramic layers must electrically insulate the heater. This clearly establishes that the gas tight layers of Mase (including layer 50) should be insulating.

15. Applicant also urges that Suzuki and Mase are drawn to different types of sensors (i.e. cup-shaped and multilayered planar sensors respectively) and one in the planar art would not look to teachings from the cup-shaped art. This is unpersuasive for a couple of reasons. First, this conclusion of the applicant is contradicted by col. 1, line 38 through col. 2, lines 15 of Mase

where they write knowledgeably about both the tubular (i.e. cup-shaped) and planar sensor art. As Mase describes, the two types of sensors are seen as two different body structures that have their requisite advantages and disadvantages. However, they are based on the same electrolyte, the same electrodes, the same sintering technology, etc. In other words, techniques utilized for one type of sensor will often have relevancy in the other type of sensor. Suzuki also recognizes this (col. 5, lines 51-54). If Mase and Suzuki were aware of the nexus between planar and cup-shaped sensors, presumably one possessing ordinary skill in the art would have been aware of that nexus. Second, applicant appears to convolute how the teaching of Suzuki is being utilized. In particular, applicant urges on page 8 that one "would not consider *employing the cup-shaped sensor body* arrangement of Suzuki for the multilayered type sensor of Mase" (emphasis added). That was not the basis for the rejection. The examiner does not appear to have ever suggested that Mase should be constructed as a cup-shaped sensor. Rather, Mase teaches a boundary layer that is more porous than the insulator and electrolyte it is in between. Mase did not teach how one should arrive at that porous structure. Suzuki taught that it was known in the art to arrive at a porous body by utilizing particles that are larger than the particles utilized for adjacent less porous bodies. This structure of the rejection is in contradiction with what the applicant alleges the rejection states.

16. Applicant also remarks on the fact that Suzuki is drawn to an outer layer and not an inner boundary layer. The examiner fails to appreciate the significance of this. If using larger particles provides a more porous outer layer, then presumably it would also provide a more porous inner layer as well. Moreover, if the means of Suzuki for forming a porous layer were

known in the art, one possessing ordinary skill in the art would have recognized that that means would have utility for porous layers elsewhere in art recognized sensors.

17. Applicant also urges that Suzuki utilizes plasma injection-welding for the formation of the layer of the porous layer and one with ordinary skill in the art would not have considered this in multilayered type sensors. Suzuki appears to contradict this conclusion. See col. 5, lines 51-54. Moreover, isn't Suzuki a multilayered structure as well? See fig. 2 and col. 5, line 35-45. Finally, applicant doesn't appear to ever give a reason why one in the multilayered sensor art would have excluded a teaching utilizing plasma-injection welding. Is there a reason why the injection-welding is incompatible with multiplayer sensor construction? It is not sufficient to simply broadly allege that one reference's particular layer construction means excludes its relevance from other types of sensor without some specific reason for that allegation.

18. With respect to the arguments concerning whether 54 and 34 are more porous than the neighboring layers, it would appear that the Board resolved this issue previously (see page 4, second paragraph of the Board decision). Moreover, because layer 54 is described as being "porous" and layer 50 as being "gas-tight", one possessing ordinary skill in the art could safely presume that 54 is more porous that 50. In fact, because only particular layers are being described as porous, the other layers are presumably less porous than these porous layers. To suggest otherwise would result in the conclusion that what Mase is calling a "porous layer" is actually *less* porous than other layers in the sensor that are never specified as being porous. If the electrolyte was as porous or more porous than the "porous layer", why would Mase single out these boundary layers for the moniker "porous layer"? Furthermore, the previous examiner dealt at length with that argument on page 4 of the examiner's answer. Applicant does not

appear to have ever specifically rebutted the examiner's conclusion, but is merely rearguing what the previous examiner had already addressed. If the examiner was in error with his conclusion about the lack of porosity of the electrolyte, what is that error?

19. With respect to Tatumoto and the alumina particle size, applicant urges that 2.3 microns is not close to 3 micron. However, they differ by less than a micron, which the examiner believes is very close. Moreover, Tatumoto is drawn to the size of the starting material and Hamano and Yokota presumably evidenced that the sintered particle size goes up after sintering rendering the difference between a 2.3 micron starting material and 3 micron sintered particle size either smaller or non-existent.

Conclusion

20. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kaj Olsen whose telephone number is (571) 272-1344. The examiner can normally be reached on Monday through Thursday from 6:30 A.M. to 4:00 P.M. and on alternate Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen, can be reached on 571-272-1342. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Kaj Olsen Ph.D.
Primary Examiner
AU 1753
May 27, 2004